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APPRENTICESHIP TRAINING

POWER SYSTEM ELECTRICIAN Program



MANPOWER
Apprenticeship and Trade
Certification Division

on
27368



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COURSE OUTLINE

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POWER SYSTEM ELECTRICIAN TRADE

THE GOAL OF APPRENTICESHIP TRAINING

To develop a competent tradesman who, through skill and knowledge, is capable of construction or maintenance of electrical utility power systems, power station equipment, power system metering, protection and control apparatus.

THE PRODUCT OF APPRENTICESHIP—

a graduate who will:

- * understand the principles of sound and safe trade practices.
- * interpret drawings, plans and be able to layout and develop projects according to specifications.
- * use the tools of the trade in a safe and proper manner.
- * relate to the work of other tradesmen employed in industry either on construction or in maintenance.
- * perform assigned tasks in accordance with quality and production standards required in industry.

POWER SYSTEM ELECTRICIAN APPRENTICESHIP INFORMATION

Basic Requirements:

- * Indenture for four periods of Trade experience.
- * Attend an eight week technical training course in the first and second periods and a nine week technical training course in the third and fourth periods.
- * Fulfill the requirements for each period including 1800 hours of work experience inclusive of time spent at the training course; successfully complete the technical training course and obtain a satisfactory employer's report.
- * Education — a minimum requirement is the completion of mathematics 20 or a pass on an equivalent entrance examination as prescribed by the Trade regulation.
- * Age — the minimum age for apprentices is 16 years. There is no upper age limit.

Credits:

- * Accelerated patterns of apprenticeship may be granted for related technical training and/or experience.

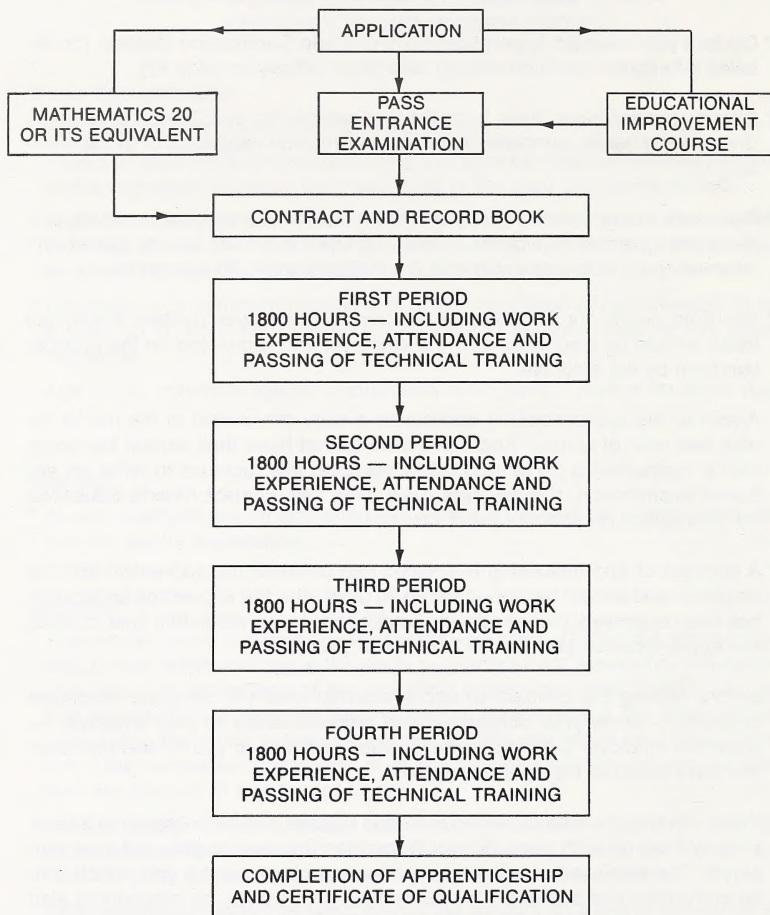
Benefits:

- * Apprenticeship is a learning-while-earning program. During the apprenticeship period, while working at the trade, apprentices are assured by regulation of a minimum percentage of the prevailing journeyman rate: 50% during the first period, 60% during the second period, 67.5% during the third period, 75% during the fourth period. Progress from one rate to the next takes place only after successful completion of all the requirements for each period (details are outlined in the Record Book).
- * All apprentices 17 years of age and older are normally eligible for training allowances while attending technical training courses. These allowances are funded by the Canada Employment and Immigration Commission.
- * Administrative procedures establishing the amount of training allowance is complex and can vary with an individual's circumstances. Contact a local Canada Employment Centre for details.
- * An apprentice who successfully completes the program will graduate with an Alberta Completion of Apprenticeship Certificate and a Certificate of Qualification.
- * The most significant benefit to the graduate apprentice is that he is well trained in technical and practical aspects of the trade and is able to make a worthwhile and productive contribution to society. Society in return, will provide an opportunity for livelihood.

DIRECTIONS FOR PROSPECTIVE APPRENTICES

- * Contact your nearest Apprenticeship and Trade Certification Division for detailed information and counselling (see list of offices on page 47).
- * Obtain an application form from the Apprenticeship and Trade Certification Division and neatly complete, in full, the information requested of the apprentice.
- * Persevere in the search for apprentice employment and upon obtaining employment, give the application to the employer. It should be completed and returned to an Apprenticeship and Trade Certification Division forthwith.
- * Any time credit, for previous experience in the Power System Electrician trade, should be discussed with the employer and requested on the application form by the employer.
- * Attach to the apprenticeship application a copy (transcript) of the marks for your last year of school. Applicants who do not have their school transcript with a mathematics 20 or equivalent standing are required to write an entrance examination. If transcripts have been lost, contact Alberta Education for information on school transcripts.
- * A contract of apprenticeship is entered into between the apprentice and the employer and should be signed within 90 days after the apprentice application has been approved. If contracts have not been issued within this time, contact the Apprenticeship and Trade Certification Division.
- * Before signing the contract of apprenticeship read the complete document carefully — know your obligations and responsibilities to your employer — know the employer's obligations and responsibilities to you — feel confident you have selected the right occupation.
- * Know when you will be expected to attend classes and be prepared to attend. In early May of each year, School Schedules are sent to you and your employer. The employer also receives a class selection card for you, which is to be completed and submitted for scheduling. Information on procedures also accompanies the above. Confirmation on the date you actually get scheduled and/or the Official Notice will follow at the appropriate time(s).
- * Prepare in advance for the financial obligations required of you during school training. Reference materials and school supplies are paid for by the apprentice.
- * While an apprentice, it will be your responsibility to respond promptly to mailed directions and requests from the Apprenticeship and Trade Certification Division.

APPRENTICESHIP ROUTE TOWARD CERTIFICATION



APPRENTICESHIP COMMITTEE STRUCTURE

Power System Electrician Provincial Apprenticeship Committee

The Provincial Apprenticeship Committee for the Power System Electrician Trade is comprised of members from Local Apprenticeship Committees from the cities of Edmonton, Calgary, Red Deer, Lethbridge and Medicine Hat.

This Committee is concerned with the policies that guide the program and make recommendations to the Apprenticeship and Trade Certification Board and the Director of the Apprenticeship and Trade Certification Division in the following areas:

- * Contribute current information relative to changes in the trade and requirements of industry.
- * Make recommendations for changes to existing trade regulations.
- * Assist in updating of the training program through recommendations for revisions to the course outline and attendant examinations.

Power System Electrician Apprenticeship Committee

Local Apprenticeship Committees are concerned with individuals and trade situations within a local region. Meetings are held throughout the year to make recommendations and to discuss problems relating to the apprenticeship program. Members who serve on committees are nominated by employer and labour organizations, and membership is equally divided into employer and employee representation in accordance with The Manpower Development Act.

Apprenticeship Committee Members:

Mr. L. D. Hamilton — Red Deer — Employee
Mr. B. A. Harburn — Red Deer — Employee
Mr. A. K. Mann — Edmonton — Employer
Mr. W. J. Badowsky — Edmonton — Employer
Mr. M. Raffard — Edmonton — Employee
Mr. G. Barth — Medicine Hat — Employee
Mr. D. D. Hannay — Medicine Hat — Employer
Mr. J. H. Walker — Lethbridge — Employer
Mr. J. Lowther — Lethbridge — Employee

POWER SYSTEM ELECTRICIAN PROGRAM COURSE OUTLINE

This outline has been prepared in accordance with recommendations from the Provincial Apprenticeship Committee for the Power Electrician Trade in the Province of Alberta.

The outline was updated following consideration given to recommendations and suggestions from:

- Local Apprenticeship Committees
- Representatives from training institutes
- Curriculum Sub-Committee from the Provincial Apprenticeship Committee

PROCEDURES FOR RECOMMENDING REVISION(S) TO THE COURSE OUTLINE

Any concerned citizen or group in the Province of Alberta may make recommendations for change by writing to Apprenticeship and Trade Certification Division, Edmonton.

It is requested that recommendations for change refer to specific areas and state references used. Recommendations received will be placed before regular meetings of the Provincial Apprenticeship Committee.

SAFETY EDUCATION

Safe working procedures and conditions, accident prevention and the preservation of health is of primary importance in the Apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of the government, employers, employees and the general public. Therefore, it is imperative that all parties become aware of circumstances that may lead to injury or harm and that safe learning experiences and environment can be created by controlling the variables and behaviors that may contribute to or cause an accident and/or an injury.

It is generally recognized that a safe attitude contributes to an accident free environment. As a result a healthy safe attitude towards accidents will benefit an employee by helping to avoid injury, loss of time and loss of pay.

A tradesman is possibly exposed to more hazards than any other person in the work force and therefore, should be familiar with the Occupational Health and Safety Act and Regulations dealing with his own personal safety and the special safety rules applying to each job.

LEGAL AND ADMINISTRATIVE ASPECTS

Employer's Responsibilities:

Accident prevention and the provisions of safe working conditions are the responsibilities of an employer. The company is responsible for:

1. The provision and maintenance of safety equipment
2. The provision of protective devices and clothing (as required by the Occupational Health & Safety Act, General Safety Regulations)
3. The enforcement of safe working procedures
4. Adequate safeguards for machinery, equipment and tools
5. Observance of all accident prevention regulations
6. Adequate training to allow a worker to use or operate equipment in an effective and safe manner.

Government's Responsibilities:

The Apprenticeship and Trade Certification Division in conjunction with the respective Provincial Apprenticeship Committee assumes the responsibility to assure that adequate safety is reflected in the curriculum and that adequate safety instruction is presented at the training establishments.

The Occupational Health and Safety Inspection Branch assumes the responsibility for periodic inspection of the operation to ensure that regulations for industry are being correctly observed.

Individual's Responsibilities:

The employee is responsible for:

1. Knowing and working in accordance with the safety regulations pertaining to job environment and
2. Working in such a way as not to endanger himself or his fellow employees

The major factor in safety is the individual employee, his personal attitude toward safety and having an awareness of the respective safety regulation.

POWER SYSTEM ELECTRICIAN PROGRAM

Subjects and Time Distribution

First Period	8 Weeks	30 Hours Per Week	240 Hours	Page
Section One:	Electrical Theory — I		72	9
Section Two:	Electrical Laboratory — I		80	12
Section Three:	Electrical Regulations & Safety — I		32	14
Section Four:	Technical Mathematics — I		40	15
Section Five:	Effective Communications		16	16
Second Period	8 Weeks	30 Hours Per Week	240 Hours	Page
Section One:	Electrical Theory — II		64	18
Section Two:	Electrical Laboratory — II		40	20
Section Three:	Machines Theory — II		40	21
Section Four:	Machines Laboratory — II		40	23
Section Five:	Electrical Regulations & Safety — II		24	24
Section Six:	Technical Mathematics — II		32	24
Third Period	9 Weeks	31 Hours Per Week	279 Hours	Page
Section One:	Electronics Theory — III		36	26
Section Two:	Electronics Laboratory — III		36	27
Section Three:	Substation Theory — III		72	28
Section Four:	Substation Laboratory — III		45	32
Section Five:	Metering Theory — III		36	33
Section Six:	Metering Laboratory — III		27	34
Section Seven:	Print Reading — III		27	35
Fourth Period	9 Weeks	31 Hours Per Week	279 Hours	Page
Section One:	Electronics Theory — IV		45	36
Section Two:	Electronics Laboratory — IV		45	37
Section Three:	Substation Theory — IV		54	38
Section Four:	Substation Laboratory — IV		54	41
Section Five:	Metering Theory — IV		36	43
Section Six:	Metering Laboratory — IV		27	44
Section Seven:	Electrical Regulations & Safety — IV		18	45

FIRST PERIOD TECHNICAL TRAINING

SECTION ONE:	ELECTRICAL THEORY — I	72 Hours
A. Principles of Electricity		6 Hours
1. Structure of matter		
2. Electron Theory		
3. Theory of current flow		
4. Generation of E.M.F.		
5. Conductors, insulators, semiconductors		
6. Impedance — resistance		
7. Definition of:		
(a) volts		
(b) amperes		
(c) ohms		
(d) watts		
(e) watthours		
8. Electrical signs and symbols		
B. Conductors and Insulators		4 Hours
1. Conductor measurements		
(a) cross sectional area		
(b) wire tables		
(c) resistance of conductors		
(d) temperature coefficient		
(e) resistivity		
2. Insulators		
(a) types		
(b) dielectric strength		
C. Measurement of:		1 Hour
1. Voltage		
2. Current		
3. Resistance		
4. Power		
D. Ohm's Law		1 Hour
E. Power (S.I.)		4 Hours
1. Work		
2. Torque		

3. Mechanical to electrical

4. Efficiency

F. Analyzing Electric Circuits

5 Hours

1. Series circuits

- (a) current
- (b) voltage
- (c) resistance
- (d) Kirchoff's voltage law
- (e) power

2. Parallel circuits

6 Hours

- (a) current
- (b) voltage
- (c) resistance
- (d) Kirchoff's current law
- (e) power
- (f) conductance (terminology)

3. Series-Parallel circuits

6 Hours

- (a) equivalent circuits
- (b) Kirchoff's law
- (c) voltage divider principle
- (d) current divider principle

G. Single Phase Services

8 Hours

1. Edison three wire system

- (a) balanced
- (b) unbalanced
- (c) neutral disconnected

2. Voltage drop, line loss, efficiency

3. Grounding

4. Watthour-Meter

- (a) single phase — two wire
- (b) single phase — three wire
- (c) using Kh to determine watts
- (d) installation
- (e) reading

H. Magnetism

5 Hours

1. Nature of a magnetic field

2. Lines of force

3. Characteristics of magnetic lines of force

4. Magnetic field around a current carrying conductor

5. Magnetic field around a current carrying coil

6. Magnetic flux
7. Magnetomotive force
8. Reluctance
9. Permeability
10. Flux density
11. Flux field intensity
12. Magnetic materials
13. Magnetization curves
14. Hysteresis
15. Eddy currents
16. Magnetic shielding

I. Inductance

5 Hours

1. Electromagnetic induction
2. Faraday's law
3. Lenz's law
4. Self inductance
5. Mutual inductance
6. Factors governing inductance
7. Inductors in series
8. Inductors in parallel
9. Time constant

J. Capacitance

5 Hours

1. Opposition to changing voltage
2. Static electricity
3. Electric field direction
4. Field intensity
5. Lines of equipotential
6. Electrostatic induction
7. Dielectric constant
8. Dielectric strength
9. Types of capacitors
10. Factors governing capacitance

11. Capacitors in series
12. Capacitors in parallel
13. Charging a capacitor with a constant current
14. Charging a capacitor with a constant voltage source
15. Time constant

K. Surveying **2 Hours**

1. Third system of survey for Western Canada
2. Location and identification of stakes
3. Reading of LSD and Township maps
4. Read transit

L. Batteries (Cells) **3 Hours**

1. Types
2. Ratings
3. Series and Parallel
4. Hazards and precautions
5. Charging
6. Testing
7. Temperature Effects

SECTION TWO: ELECTRICAL LABORATORY **80 Hours**

A. Safety **1 Hour**

1. Electrical
2. Fusing

B. Tools **3 Hours**

1. Handtools
 - (a) identification
 - (b) care
 - (c) maintenance
2. Power tools
 - (a) identification
 - (b) care

C. Rigging **5 Hours**

1. Safety when lifting
 - (a) safety factors

- (b) critical angle of slings
- (c) load limits

2. Basic hand signals for hoisting

3. Mechanical advantage in:

- (a) block and tackle
- (b) leverage

4. Cable and rope

- (a) care and use of:
 - (i) winch cable
 - (ii) wire rope
 - (iii) synthetic ropes
- (b) basic knots
- (c) slings

D. Conductors

2 Hours

- 1. Types of conductors
- 2. Types of cables
- 3. Bus bar
- 4. Wire gauge

E. Splicing & Terminating

8 Hours

- 1. Basic soldering and de-soldering
- 2. Oxide inhibitors
- 3. Mechanical wire and cable connectors
- 4. Copper/aluminum connectors
- 5. Cold flow
- 6. Care and adjustment of compression tools
- 7. Use of correct sleeves and compression tools
- 8. Cable preparation for termination and splicing (except H.V. cable)
- 9. Insulating splices and joints
- 10. Thermit welding (demonstrate)
- 11. Ampact tools (demonstrate)

F. Schematic and Wiring Diagrams

4 Hours

G. Instruments

3 Hours

- 1. Care
- 2. Proper connections
- 3. Reading scales

H. Power Supplies

1 Hour

I. Electrical Circuits	26 Hours
1. Ohm's Law	
2. Series circuit	
3. Parallel circuit	
4. Series-parallel circuit	
5. Switch circuits	
6. Alarm circuits	
7. Kirchoff's law	
8. Voltage divider circuits	
9. Wattmeter connection	
J. Resistance	3 Hours
1. Color code	
2. Ratings	
3. Temperature effect	
K. Services	6 Hours
1. Edison three-wire circuit	
2. Single phase — 2 wire kWhr meter	
3. Single phase — 3 wire kWhr meter	
L. Relays	12 Hours
1. Holding — electrical	
2. Latching	
3. Motor magnetics	
(a) stop start	
(b) jogging	
(c) limit switches	
(d) time delay	
(e) reversing	
4. Photo electric	
SECTION THREE: ELECTRICAL REGULATIONS & SAFETY — I	32 Hours
A. Worker's Compensation Board	2 Hours
B. Introduction to Occupational Health and Safety Act & Regulations	4 Hours

C. Electrical Utility Regulations	10 Hours
1. Part I Definitions	
2. Part II Scope & General Requirements	
3. Part III Safety Rules	
D. Canadian Electrical Code — Part I	10 Hours
1. Section 0 Definitions	
2. Section 2 General Rules	
3. Section 4 Conductors	
E. Safety	2 Hours
1. Frost bite	
2. Treating burns	
3. Procedure in injuries	
4. Current through body	
SECTION FOUR: TECHNICAL MATHEMATICS I	40 Hours
A. Mathematical Fundamentals	2 Hours
1. Review	
(a) addition, subtraction, multiplication, division	
(i) whole numbers	
(ii) decimals	
(iii) fractions	
(iv) signal numbers	
2. Ratio and proportion	1 Hour
3. Fundamentals of algebra	3 Hours
(a) formula evaluation	
(b) formula transposition	
(i) addition and subtraction	
(ii) multiplication and division	
(iii) powers and roots	
4. Solution of equations	2 Hours
5. Scientific notation	
(a) laws of exponents	
B. Metric System	2 Hours
1. Base units	
(a) linear	
(b) mass	
(c) temperature	

- (d) time
- (e) electric current
- (f) luminous intensity

2. Prefixes and powers of 10

3. Derived units

C. Use of calculator **1 Hour**

- 1. Addition, subtraction, multiplication, division keys
- 2. Squares and square root keys
- 3. Power and roots other than square and square roots
- 4. Powers of 10 key

D. Graphs **2 Hours**

- 1. Application
- 2. Plotting
- 3. Interpretation

E. Electrical Problems **20 Hours**

- 1. Ohm's law
- 2. Series circuit
- 3. Parallel circuit
- 4. Series-parallel circuit
- 5. Power and energy
- 6. Line loss and voltage drop
- 7. Wire calculations
- 8. Resistance and temperature

SECTION FIVE: EFFECTIVE COMMUNICATIONS **16 Hours**

A. Communication **1 Hour**

- 1. Process
- 2. Barriers

B. Written Communication **6 Hours**

- 1. Reports
 - (a) accident
 - (b) progress
 - (c) failure

2. Memos
3. Letters
 - (a) claim
 - (b) inquiry
 - (c) statement of completion
4. Forms
5. Directives

C. Oral Communication	4 Hours
1. Effective directives	
2. Presentation <ol style="list-style-type: none"> (a) emphasis on clarity (b) simplicity 	
D. Proper Use of Radio	2 Hours
1. Procedures	
2. Code of etiquette	
3. Governing bodies and regulations	
E. Apprenticeship Contract	1 Hour

SECOND PERIOD TECHNICAL TRAINING

SECTION ONE:	ELECTRICAL THEORY II	64 Hours
A. Generation of Sine Wave Alternating Current		3 Hours
1. Cycles		
2. Poles		
3. Frequency		
4. Mechanical and electrical degrees		
B. Values of Sine Waves		3 Hours
1. Instantaneous		
2. Average		
3. Effective (RMS)		
C. Phasors		2 Hours
1. Direction		
2. Magnitude		
3. Relationships (I & E)		
D. Inductive Reactance		4 Hours
1. Derivation of X_L		
2. Phasor representation		
3. Problems with X_L		
4. Cosine law		
E. Capacitive Reactance		4 Hours
1. Derivation of X_C		
2. Phasor representation		
3. Problems with X_C		
F. Impedance		3 Hours
1. Units		
2. Impedance triangle		
3. Phase representation		
G. Single Phase Circuits		18 Hours
1. Series circuits (RLC)		
2. Parallel circuits (RLC)		

3. Voltage and current relationships
4. Power
 - (a) active component
 - (b) reactive component
 - (c) apparent component
 - (d) power triangle
5. Power factor
 - (a) power factor angle
 - (b) power factor correction
6. Resonance (Power Systems)
 - (a) series (ferroresonance)
 - (b) parallel
 - (c) quality Q
 - (i) grading capacitors on circuit breakers
 - (ii) potential transformers
 - (iii) URD cable

H. Three Phase Circuits

14 Hours

1. Introduction
 - (a) advantages
 - (b) generation of three phase voltages
2. Three phase phasors
 - (a) double subscript notation
 - (b) phase rotation
 - (c) phase sequence
3. Wye connected circuits (balanced and unbalanced)
 - (a) voltage and current relationships
 - (b) phasor diagram
 - (c) current in neutral
 - (d) power factor
 - (e) true power
 - (f) reactive power
 - (g) apparent power
 - (h) power triangle
 - (i) power factor correction
4. Delta connected circuits (balanced and unbalanced)
 - (a) voltage and current relationships
 - (b) phasor diagram
 - (c) power factor
 - (d) true power
 - (e) reactive power
 - (f) apparent power
 - (g) power triangle
 - (h) power factor correction

I. Power Measurement	5 Hours
1. Three wattmeter method	
2. Two wattmeter method	
3. Blondel's theorem	
SECTION TWO: ELECTRICAL LABORATORY II	40 Hours
A. Single Phase Circuit Experiments	2 Hours
1. Inductors	
(a) series	
(b) parallel	
2. Capacitors	2 Hours
(a) series	
(b) parallel	
(c) safety — stored charges (cables, trans, cap banks)	
3. Series Circuits	9 Hours
(a) resistance and inductance	
(b) resistance and capacitance	
(c) resistance, inductance and capacitance	
(d) series resonance	
(i) effects	
(ii) ferroresonance	
4. Parallel circuits	11 Hours
(a) resistance and inductance	
(b) resistance and capacitance	
(c) resistance, inductance and capacitance	
(d) parallel resonance	
(i) effects	
(ii) power factor correction	
B. Three Phase Circuits	2 Hours
1. Three phase — four wire (neutral current)	
2. Reversal of phase	
3. Phase sequence indicator	
C. Three Phase Power Measurement	4 Hours
1. Three phase — four wire	
2. Three phase — three wire	
D. Three Phase Power Factor Correction	4 Hours
1. Wye circuit	
2. Delta circuit	

SECTION THREE:	MACHINES THEORY II	40 Hours
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A. Single Phase Transformers		12 Hours
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1. Construction
2. Operating principles
 - (a) phasor diagram
 - (b) exciting current
 - (c) magnetizing current
 - (d) iron loss component
3. Ratings
4. Ratio and resistance
 - (a) ratio of transformation
 - (b) turns ratio
5. Polarity
6. Losses
7. Efficiency
8. Voltage regulation
9. Tap changers
10. Cooling methods
11. Types
 - (a) distribution
 - (b) power
 - (c) network
12. Backfeed
13. Transformer liquid
 - (a) taking a sample
 - (b) testing a sample
 - (c) PCB
 - (i) regulations
 - (ii) handling
14. Name plate data

B. Autotransformers		4 Hours
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1. Theory of operation
2. Application
 - (a) line booster
 - (b) step voltage regulator
3. Safety precautions

C. Three Phase Transformers**6 Hours**

1. Voltage, current and power relationships
2. Phasor diagrams
3. Ratings
4. Connections
 - (a) wye-wye
 - (b) delta-delta
 - (c) wye-delta
 - (d) delta-wye
 - (e) open delta-open delta
 - (f) open wye-open delta
5. Importance of neutral
6. Angular displacement
7. Parallel operation
8. Phasing sticks
9. Name plate data

D. Three Phase Motors**4 Hours**

1. Construction
2. Theory of operation
3. Speed
4. % slip
5. Power factor
6. Torque
7. Efficiency
8. Starters
9. Fusing
10. Reversing
11. Name plate data
12. Effects of under and over voltage

E. Single Phase Motors**4 Hours**

1. Construction
2. Applications
3. Types
 - (a) split-phase
 - (b) capacitor start

- (c) universal
- (d) shaded pole
- (e) synchronous

4. Development of rotating magnetic field
5. Torque development
6. Fusing
7. Reversing
8. Braking
9. Name plate data
10. Effects of under and over voltage

F. D.C. Motors **2 Hours**

1. Construction
2. Theory of operation
3. Applications
4. Speed control

SECTION FOUR: MACHINES LABORATORY II **40 Hours**

A. Single Phase Transformers **14 Hours**

1. Ratings
2. Ratio and resistance
3. Polarities
4. Voltage and current relationships
5. Losses and efficiency
6. Paralleling
7. High voltage insulation testing
8. Oil and askeral (PCB)
 - (a) handling
 - (b) taking sample
 - (c) testing

B. Three Phase Transformer and Transformer Banks **14 Hours**

1. Voltage, current and power relationships
2. Ratio of transformation
3. Transformer connections
 - (a) delta-delta

- (b) wye-wye
- (c) wye-delta
- (d) delta-wye
- (e) open delta-open delta
- (f) open wye-open delta
- (g) delta-delta-(4 wire)

4. Angular displacement

5. Paralleling

C. Motors — Single and Three Phase

4 Hours

1. Starting

2. Reversing

3. Vibration

4. Open line

5. Change bearings

6. Braking

7. Identify parts

8. Connections

9. Dual-voltage

10. Tests

SECTION FIVE: ELECTRICAL REGULATIONS & SAFETY II

24 Hours

A. Electrical Utility Regulations

8 Hours

1. Part IV — Grounding

2. Part VI — Electrical Supply Stations

B. Canadian Electrical Code

6 Hours

1. Section 6 — Services and Service Equipment

2. Section 10 — Grounding

C. Protective Working Grounds

6 Hours

SECTION SIX: TECHNICAL MATHEMATICS II

32 Hours

A. Basic Trigonometric Functions

3 Hours

1. Sine, cosine and tangent

2. Find sides and angles

B. Alternating Current	1 Hour
1. Instantaneous	
2. R.M.S.	
3. Average	
4. E_{max} and I_{max}	
C. Analytical Geometry	1 Hour
D. Phasors	4 Hours
1. Direction and magnitude	
2. Rectangular and polar coordinates	
3. Addition and subtraction — mathematical method	
4. Addition and subtraction — scalar method	
E. J Notation	2 Hours
F. Electrical Problems	12 Hours
1. Series (RLC)	
2. Parallel (RLC)	
3. Series parallel (RLC)	
4. Power factor correction	
5. Transformers	
G. Three Phase	5 Hours
1. Delta and wye	
(a) balanced load	
(b) unbalanced load	
2. Voltage, current and power	
(a) line	
(b) phase	

THIRD PERIOD TECHNICAL TRAINING

SECTION ONE:	ELECTRONICS THEORY III	36 Hours
A. Review — Slanted Toward Electronics		4 Hours
1. Voltage		
(a) voltage — D.C., A.C., D.C. offset		
2. Resistance		
(a) series-parallel		
3. Inductance		
(a) series-parallel		
4. Capacitance		
(a) series-parallel		
B. Physics of Semiconductor		1 Hour
1. Crystal structure		
2. Minority and majority current carriers		
3. P and N type materials		
C. PN Junction (Diode)		4 Hours
1. Electrical characteristics		
2. Dynamic resistance		
3. Heat effect		
4. Rating		
5. Specification sheet		
6. Applications		
D. Rectifiers (Half Wave and Full Wave)		6 Hours
1. Single phase		
2. Three phase		
3. Six phase		
4. Wave shapes for each rectifier		
5. Average D.C. values for each rectifier		
6. Ratings for each rectifier		
E. Filters		2 Hours
1. Capacitor & choke filters		
2. Loading and ripple factor		

F. Voltage Regulators	4 Hours
<ul style="list-style-type: none"> 1. Zener diode <ul style="list-style-type: none"> (a) characteristics (b) ratings and specification sheet (c) calculation for zener voltage regulator 2. Integrated circuit regulator (chip) 	
G. Amplifier (Control Device)	4 Hours
<ul style="list-style-type: none"> 1. Definition 2. Voltage gain 3. Current gain 4. Power gain 5. Input impedance 6. Output impedance 	
H. Transistor	5 Hours
<ul style="list-style-type: none"> 1. Theory of operation 2. Rating 3. Biasing 4. Application <ul style="list-style-type: none"> (a) switching circuit (b) amplifier 	
SECTION TWO: ELECTRONICS LABORATORY III	36 Hours
A. Operation of:	8 Hours
<ul style="list-style-type: none"> 1. D.C. power supply 2. Signal generator 3. Electronic measuring instruments 4. Oscilloscope 	
B. Diode	2 Hours
<ul style="list-style-type: none"> 1. Rating 2. Testing 3. Heat effect 	
C. Rectifiers	6 Hours
<ul style="list-style-type: none"> 1. Construct single phase rectifiers <ul style="list-style-type: none"> (a) half wave 	

- (b) full wave
 - (c) waveforms
 - (d) average D.C. values
2. Construct three phase rectifiers
 - (a) half wave
 - (b) full wave
 - (c) waveforms
 - (d) average D.C. values
 3. Construct six phase rectifiers
 - (a) waveforms
 - (b) average D.C. values

D. Filters 2 Hours

1. Construct L type
2. Construct π type
3. Ripple factor

E. Clippers and Clampers 2 Hours

F. Multipliers 2 Hours

G. Zener Diode 4 Hours

1. Rating
2. Testing
3. Regulator circuit
4. Voltage regulator chip

H. Transistors 4 Hours

1. Rating
2. Testing
3. Transistor as a switch
4. Common emitter amplifier

SECTION THREE: SUBSTATION THEORY III 72 Hours

A. Instrument Transformers 7 Hours

1. Potential transformer
 - (a) types
 - (b) rating
 - (c) polarities

- (d) accuracy
 - (i) phase angle
 - (ii) ratio
- (e) testing
- (f) connections
- (g) for metering and relaying
- (h) metering tanks
- (i) test blocks

2. Current transformers

- (a) types
- (b) rating-burden
- (c) polarities
- (d) accuracy
 - (i) phase angle
 - (ii) ratio
- (e) testing
- (f) connections
- (g) for metering and relaying
- (h) metering tanks
- (i) test blocks

B. Power Circuit Breakers

9 Hours

1. Physical characteristics
2. Comparison of electrical and operating characteristics
3. Types
 - (a) bulk oil
 - (b) minimum oil
 - (c) di-ion air
 - (d) air blast
 - (e) SF6
 - (f) vacuum
 - (g) circuit switcher
4. Control schematic
5. Applications
6. Advantages & disadvantages

C. Power Systems

3 Hours

1. Location
2. Reliability of service
3. Functions
 - (a) switching
 - (b) transformation
 - (c) voltage control

4. Types
 - (a) bulk transmission
 - (b) transmission
 - (c) subtransmission
 - (d) distribution
5. Device numbers

D. Bus Configurations

3 Hours

1. Single-bus switching system
2. Transfer-bus switching system
3. Double-bus switching system
4. Ring-bus switching system
5. Mesh switching system
6. Breaker and one-half
7. Breaker and one-third

E. Switching Equipment

2 Hours

1. Air switches
2. Fused switches
3. Bypass switches
4. Disconnect switches
5. Application

F. Fault Calculations

7 Hours

1. Sources of fault current
2. Sub-transient reactance
3. Transient reactance
4. Synchronous reactance
5. Per unit
6. Delta-wye transformation
7. Application for:
 - (a) breaker ratings
 - (b) bus ratings
 - (c) relay settings
 - (d) fuse size

G. Relaying

2 Hours

1. Designations
2. Construction feature

3. Types	
4. Classification	
H. Relaying Systems	3 Hours
1. Primary and back-up protection	
2. Zones of protection	
3. Circuits	
(a) single line	
(b) A.C. elementary	
I. Overcurrent Protection	7 Hours
1. Types	
2. Curves	
3. Connection in a system	
4. Coordination	
5. Clearing times	
J. Directional Relays	6 Hours
1. Theory of operation	
2. Power	
3. Overcurrent	
K. Differential Protection	6 Hours
1. Application	
2. Transformer	
3. Generator	
4. Bus	
5. Pilot wire	
L. Gas Detector	3 Hours
1. Theory of operation	
2. Types	
3. Testing	
M. Impedance Relay	5 Hours
1. Theory of operation	
2. Mechanical	
3. Static	
N. Synchronism — Check Relay	2 Hours

O. Frequency Relay	2 Hours
1. Theory of operation	
2. Applications	
P. Network Relays	2 Hours
SECTION FOUR: SUBSTATION LAB III	45 Hours
A. Test Overcurrent Relay	8 Hours
1. Electromechanical	
2. Electronic	
B. Test Directional Relay	6 Hours
1. Electromechanical	
2. Electronic	
C. Test Differential Relay	4 Hours
D. Connecting Power Circuit Breaker	10 Hours
1. Trace wiring	
2. Operate	
3. Connect complete relay system (simulate fault and operate)	
4. Maintenance	
E. Connect Fault Simulators	2 Hours
F. Simulate Protective Schemes	6 Hours
1. Frequency relay	
2. Synchronism — check	
3. Reclosing	
4. Current balance	
G. Proper Testing Techniques	4 Hours
1. Test Unit	
2. Maintenance schedule	
3. Manufacturer's test bulletins	
4. Curves	

SECTION FIVE: METERING THEORY III 36 Hours

A. Instruments 6 Hours

1. Types
 - (a) permanent magnet
 - (b) moving iron
 - (c) electronic
2. Accuracy
3. Loading effect
4. Recording meters
5. Maxi-meters

B. Watthour Meters (Induction Type) 6 Hours

1. Construction
2. Mechanical operation
3. Theory of operation
4. Adjustments
5. Compensations
6. Constants & ratios
7. Interpretation of readings
8. Maintenance
9. Field and shop testing

C. Meter connections 8 Hours

1. Single phase
 - (a) review of 2 wire and 3 wire
 - (b) single phase — three wire C.T.
 - (c) single phase — two C.T.
 - (d) network meter
 - (e) varmeter
2. Three phase — self contained
 - (a) three wire — 2 element
 - (b) four wire — wye — 3 element
 - (c) four wire — wye — $2\frac{1}{2}$ element
 - (d) four wire — delta — $2\frac{1}{2}$ element
 - (e) phasor and formula verification of all metering methods

D. Demand Meters 4 Hours

1. Definition
2. Reasons for demand metering

3. Types
 - (a) thermal
 - (b) block
4. Resetting
5. Billing
6. kVA demand
 - (a) theory of operation

E. Department of Consumer and Corporate Affairs 3 Hours

1. Standard connections
2. Testing and verification
3. Seal extension by statistical sampling
4. Dispute testing
5. Regulations

F. Detection and Prevention of Energy Theft 3 Hours

1. Sealing
2. Internal meter tampering
3. Energy diversion

SECTION SIX: METERING LAB III 27 Hours

A. Single Phase kWhr Meter Connections 8 Hours

1. Three wire — C.T.
2. Three wire — 2 C.T.'s
3. Network meter
4. Single phase demand meter

B. Install and Test — Three Phase Self Contained 6 Hours

1. Two element
2. 2½ element
 - (a) wye
 - (b) delta

C. Safety in Changing Meters 2 Hours

D. Instrument Transformers 8 Hours

1. Potential transformers
 - (a) polarity
 - (b) connections
 - (c) protection

2. Current Transformers
 - (a) polarity
 - (b) de-magnetization
 - (c) connections

SECTION SEVEN:	PRINT READING III	27 Hours
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A. Isometric Views		1 Hour
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B. Orthographic Projection		2 Hours
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1. Basic views
2. Sections
3. Details

C. Construction Drawings		4 Hours
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1. Site plan
 - (a) legal description
 - (b) geodetic and architectural elevations
 - (c) general site information
2. Plan views
3. Elevations
4. Sections and details
5. Schematics

D. Applied Print Interpretation		13 Hours
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1. Electrical symbols and abbreviations
2. Device numbers
3. Legends
4. Material lists
5. Single line diagrams
6. Schematic diagrams
7. Distribution prints
8. Metering prints
9. Control prints
10. Ampacity diagram

E. Special Applications		4 Hours
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1. Light rail transit
2. Circuit tracing

FOURTH PERIOD TECHNICAL TRAINING

SECTION ONE:	ELECTRONICS THEORY IV	45 Hours
A. Unijunction Transistor		4 Hours
1. Basic theory		
2. Circuit analysis		
3. Circuit application		
B. Silicon Controlled Rectifier		5 Hours
1. Basic theory		
2. Circuit analysis		
3. Circuit application		
C. Diac		2 Hours
1. Basic theory		
2. Circuit analysis		
3. Circuit application		
D. Triac		2 Hours
1. Basic theory		
2. Circuit analysis		
3. Circuit application		
E. Field Effect Transistor		4 Hours
1. Basic theory		
2. Rating and characteristics		
3. Amplifier		
4. Circuit applications		
F. Operational Amplifiers		4 Hours
1. Basic theory		
2. Rating and characteristics		
3. Amplifier circuit applications		
G. Photoelectric Devices		2 Hours
1. Photo voltaic cells		
2. Photo diodes and transistors		
3. Photo conductive cells		

	4. Photo emitting devices	
	5. Circuit applications	
H.	Logic	10 Hours
	1. Basic processor concept	
	2. Develop simple program	
I.	Discuss Briefly Various Circuits Using Above Devices	3 Hours
	1. Battery charger	
	2. Step voltage regulator controls	
	3. Electronic relays	
SECTION TWO:	ELECTRONICS LABORATORY IV	45 Hours
A.	Unijunction Transistor	4 Hours
	1. Rating and testing	
	2. Oscillator	
	3. Timer	
B.	Silicon Controlled Rectifier	6 Hours
	1. Rating and testing	
	2. UJT controlled triggering	
	3. Speed control and dimmer	
	4. Controlled rectifier output	
C.	Diac	2 Hours
	1. Rating and testing	
	2. Oscillator	
	3. Timer	
D.	Triac	4 Hours
	1. Rating and testing	
	2. Speed control and dimmer	
	3. Amplifier	
E.	Field Effect Transistor	4 Hours
	1. Rating and testing	
	2. Amplifier	

F. Operational Amplifier	6 Hours
1. Inverting amplifier	
2. Non-inverting amplifier	
3. Summing amplifier	
4. Comparator	
G. Photoelectric Devices	2 Hours
H. Logic Gates	10 Hours
I. Microprocessor	6 Hours
1. Basic operation	

SECTION THREE:	SUBSTATION THEORY IV	54 Hours
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A. Power Transformer	8 Hours
1. Core and windings	
2. Transformer tank	
3. Breather	
4. Explosion vent	
5. Oil level gauges	
6. Temperature gauges	
7. Gas detector	
8. Bushings	
9. Taking oil samples	
10. Cooling	
11. OFF-load tap changers	
12. ON-load tap changers	
13. Inspecting	
14. Drying	
(a) dew point	
(b) dry ice	
15. Harmonics (Tertiary)	
16. Testing	
(a) capacitance and dissipation factor	
(b) oil	
(c) ratio	
17. Pressure relief vent	

B. Step Voltage Regulators	4 Hours
1. Applications	
2. Types	
3. Types of changers	
4. Maintenance	
5. Removing from service	
6. Wiring controls	
7. Testing	
8. Auxiliary equipment	
C. Grounding	8 Hours
1. Reasons	
2. System grounding	
3. Factors affecting	
4. Earth gradients	
5. Equipment grounding	
6. Static grounding	
7. Ungrounded systems	
8. Zig-zag transformer	
9. Wye-delta grounding	
10. Resistance grounding	
11. Testing	
D. Lightning and Surge Protection	2 Hours
1. Theory of operation	
2. Shielding	
3. Mounting	
4. Classification	
E. Transmission Line	3 Hours
1. Voltage regulation	
2. Efficiency	
F. High Voltage Switches	2 Hours
1. Types	
2. Operation	

G. Capacitors and Capacitor Banks	4 Hours
1. Construction	
2. Insulation medium	
3. Connections	
4. Protection	
5. Switching	
6. Grounding	
H. Substation Battery Supplies	2 Hours
1. Types	
2. Ratings	
3. Applications	
4. Charging	
5. Testing	
6. Maintenance	
7. Hazards and precautions	
I. Alternator	11 Hours
1. Stator	
2. Rotor	
3. Speed, poles, frequency	
4. Principle of EMF induction	
5. Generator voltage	
6. Output wave	
7. Regulation	
8. Testing	
(a) resistance	
(b) short circuit	
(c) open circuit	
9. Loading	
(a) loading curves	
(b) overload capacity	
(c) shifting kW and kVAR load	
10. Excitation methods	
(a) separately	
(b) self excited	
(c) residual magnetism	

11. Parallel operation
 - (a) reasons
 - (b) conditions
 - (c) methods
12. Standby power plants
13. Synchronized alternators

J. Power Factor Correction 2 Hours

1. Synchronous condensor

K. Precommissioning & Commissioning of Substation 4 Hours

1. Receiving equipment
2. Acceptance testing
3. Schematics
4. Site familiarization
5. Safety working clearances
6. On site testing
7. Energization — switching orders
8. In service check
9. Instruction of other staff

SECTION FOUR: SUBSTATION LAB IV 54 Hours

A. Power Transformers 14 Hours

1. Harmonics
 - (a) grounded wye
 - (b) tertiary winding
2. Use of capacitance dissipation factor bridge
3. Use of ratiometer
4. Testing oil
 - (a) di-electric
 - (b) interfacial
 - (c) acidity
 - (d) power factor
5. Three phase autotransformers

B. Testing and Connecting H.V. Switchboard 6 Hours

C. Simulate Substation**7 Hours**

1. Draw an A.C. elementary diagram from single line diagram
2. Connect the circuit with:
 - (a) transformers
 - (b) switches & circuit breaker
 - (c) proper fuses
 - (d) C.T.'s and P.T.'s
 - (e) ammeters and voltmeters
 - (f) transfer switches
 - (g) wattmeters
 - (h) power factor meter
 - (i) varmeters
 - (j) proper load

D. High Voltage Splicing**4 Hours**

1. Terminations
2. Stress cones
3. Pot heads

E. Circuit Breakers**9 Hours**

1. Testing
 - (a) timers for speed of operation
 - (b) microohmmeter (Ductor)
 - (c) insulation
 - (i) megger
 - (ii) dole
 - (iii) hypot
 - (d) oil
 - (e) motion analyzers
 - (f) charts

F. Alternator**4 Hours**

1. Paralleling
2. Synchronizing
3. Loading

G. Synchronous Motors**4 Hours**

1. Excitation characteristics
2. Load tests
3. As power factor correction

SECTION FIVE:	METERING THEORY IV	36 Hours
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A. Polyphase Meters — Instruments Transformers	9 Hours
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1. Three phase — three wire — 2 element
2. Three phase — four wire — wye — $2\frac{1}{2}$ element
3. Three phase — four wire — delta — $2\frac{1}{2}$ element
4. Test switches
5. Delta connected C.T.'s
6. Phasor and formula verification of all metering methods
7. Change meters

B. Special Metering	6 Hours
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1. kVA metering
2. kVAR metering
3. Q metering
4. Methods of phase shifting
5. Loss compensation
6. Bi-directional metering

C. Analog Metering, Totalizing and Recording	5 Hours
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1. Paralleling current transformers
2. Thermal converters
3. Transducers
4. Current outputs
5. Voltage outputs
6. Types of recorders

D. Digital Metering, Totalizing and Recording	5 Hours
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1. Pulse initiators
2. Calculating pulse values
3. Electronic totalizing
4. Solid state meters
5. Analog to pulse converters
6. Magnetic tape recorders
7. Solid state recorders

E. Telemetry	4 Hours
1. Current	
2. Frequency	
3. Pulse duration	
4. Pulse frequency	
5. Selection of communication medium	
6. Computerized metering systems	
F. Rates	3 Hours
1. Standard application of rates	
2. Metering versus typed rate	
3. Demand and consumption	
4. Load factor	
5. Power factor	
SECTION SIX: METERING LAB IV	27 Hours
A. Connect kW Demand Meter	2 Hours
B. Connect kVA Demand Meter (Rectithermal)	3 Hours
C. Connect: Polyphase kWhr Meters	6 Hours
1. Three wire — 2 element (C.T. & P.T.)	
2. Four wire (C.T. & P.T.)	
(a) wye supply	
(b) delta supply	
3. kVARHR meter	
D. Summation Metering	4 Hours
1. Pulse metering	
2. Summation metering	
E. Totalizing Analog	3 Hours
1. Transducers	
F. Field Testing	4 Hours
1. Voltage check	
2. Fuses	
3. Test block	

G. Safety in Changing Meters	5 Hours
1. Self contained	
2. Instrument rated	
 SECTION SEVEN: ELECTRICAL REGULATIONS & SAFETY IV	 18 Hours
A. Review of EUR Year 1 & 2	5 Hours
B. Canadian Electrical Code	8 Hours
1. Section 14 — Protection and Control	
2. Section 26 — Installation of Electrical Equipment	
3. Section 28 — Motors and Generators	
4. Section 36 — High Voltage Installation	
 C. Metering Safety	 3 Hours

SUGGESTED REFERENCE MATERIALS

Introduction to Electric Circuits — Bell — Prentice Hall

Basic Materials for Electricity and Electronics — Singer — McGraw Hill

Canadian Electrical Code Part I — C22.1 — 1982 — CSA

Handbook for Electricity Metering — Edison Electric Institute

Electronic Devices and Circuits Theory — Boylestad and Nashelsky —
Prentice Hall

Protection Relays Application Guide — GEC Measurements

TECHNICAL TRAINING SCHOOLS

The Power System Electrician apprenticeship training program is offered by the Alberta Manpower, Apprenticeship and Trade Certification Division. Staff and facilities for teaching the program are supplied by Alberta Manpower at:

1. Northern Alberta Institute of Technology

LOCATION OF APPRENTICESHIP AND TRADE CERTIFICATION DIVISION REGIONAL OFFICES

CALGARY

EDMONTON

FORT McMURRAY

GRANDE PRAIRIE

HINTON

LETHBRIDGE

MEDICINE HAT

PEACE RIVER

RED DEER

VERMILION

GOVERNMENT OF THE PROVINCE OF ALBERTA

ALBERTA REGULATION 363/83

(Filed on September 29, 1983)

MANPOWER DEVELOPMENT ACT

MINISTERIAL ORDER

I, Ernie Isley, Minister of Manpower, pursuant to sections 30(2) and 37(2) of the Manpower Development Act, hereby make the Regulation in the attached Appendix being the Power System Electrician Trade Regulation.

DATED at Edmonton, Alberta, this 27th day of September, 1983.

ERNIE ISLEY
Minister of Manpower

A P P E N D I X

MANPOWER DEVELOPMENT ACT

Power System Electrician Trade Regulation

1(1) In this regulation,

(a) "power system electrician" means a person engaged in the construction or maintenance of

(i) electrical utility power systems,

(ii) power station equipment, or

(iii) power system metering, protection and control apparatus;

(b) "General Regulations" means the General Regulations under the *Manpower Development Act* (Alta. Reg. 43/77);

(c) "trade" means the trade of Power System Electrician.

(2) The definitions in the General Regulations apply in this regulation.

PART 1

Apprenticeship and Trade Training

2 A person is eligible to be an apprentice power system electrician if he satisfies the requirements of section 5 of the General Regulations, and either

(a) has at least Mathematics 20 or its equivalent, or

(b) passes the entrance examination prescribed by the Board.

3(1) Subject to subsections (2), (3) and (4), an employer who is a journeyman or employs a journeyman may employ one apprentice and one additional apprentice for each additional journeyman he employs.

(2) If the supply of journeymen in a location where an employer is carrying on business is insufficient to permit the employer to carry out his work commitments, the Director may authorize the employer to employ apprentices in addition to subsection (1).

(3) The Director may authorize an employer to employ an apprentice, in addition to those under subsections (1) and (2), on a temporary basis to train him in a branch of the trade not engaged in by the employer to whom he is apprenticed.

(4) For the purpose of subsections (1) and (2), an apprentice employed temporarily under subsection (3) shall not be considered to be an apprentice to his temporary employer.

4(1) The term of apprenticeship shall consist of 4 periods of 12 months each.

(2) Each period shall consist of not less than 1800 hours of employment, including time spent attending technical training courses prescribed by the Board.

(3) The Director may not, pursuant to section 25(1) of the Act, reduce the term of apprenticeship to be served by an apprentice to less than one period of apprenticeship.

5 When a contract of apprenticeship is registered with the Director, he shall issue to the apprentice an official record book referred to in section 14 of the General Regulations.

6(1) An apprentice shall not advance to the next period until the Director has authorized him to do so by making an entry in the apprentice's official record book under subsection (2).

(2) The Director shall make an entry in the apprentice's official record book authorizing advancement to the next period, when the apprentice

(a) has completed the previous period of apprenticeship,

(b) has received, in the opinion of the Director, a satisfactory report from

(i) his employer, and

(ii) the school at which he attended technical training courses prescribed by the Board,

(c) has completed the tests and examinations prescribed by the Board, and

(d) has attained passmarks prescribed by the Board in the tests and examinations referred to in clause (c).

7 The official record book of an apprentice shall be kept in the possession of his employer and on termination of the employment of the apprentice, the employer shall present the completed book to him.

8(1) An employer shall pay to an apprentice wages that are not less than the following percentages of the prevailing wages paid to a journeyman:

(a) 50% in the first period;

(b) 60% in the 2nd period;

(c) 67.5% in the 3rd period;

(d) 75% in the 4th period.

(2) Notwithstanding subsection (1), the wages paid to an apprentice shall not be less than the minimum wage fixed pursuant to the *Employment Standards Act*.

(3) An employer is not required to pay wages to an apprentice during the time the apprentice spends attending technical training courses prescribed by the Board.

9 The hours of work and working conditions of an apprentice shall be the same as those of a journeyman.

PART 2

Certification

10 The Director may issue the following class of certificate for the trade in accordance with section 31(b) of the General Regulations:

(a) certificate of qualification.

11 In accordance with section 32(d) of the General Regulations, the Director may issue a certificate of qualification, without examination, to a person who holds

(a) a certificate of completion of apprenticeship issued by another province of Canada, or

(b) a certificate of completion of apprenticeship, a certificate of qualification or a certificate of proficiency in the trade issued by another province of Canada bearing an Interprovincial Standards Red Seal.

12(1) The holder of a certificate of qualification as a power electrician may apply to the Director for replacement of his certificate and the Director may, if he is satisfied that the work experience of the applicant is, in fact, in the trade of power system electrician, issue a certificate of qualification as a power system electrician to that person.

(2) No fee shall be charged where a certificate is issued under subsection (1).

13(1) An application to take an examination for a Certificate of Qualification shall be made to the Director.

(2) Documentary evidence acceptable to the Director shall be presented by an applicant for an examination setting out that the applicant

(a) holds a certificate equivalent to an Alberta Certificate of Qualification issued by a Provincial authority outside of Alberta, or

(b) has at least 5 years of acceptable work experience in the trade.

(3) The applicant shall provide translations into the English language acceptable to the Director, of credentials other than in English, submitted pursuant to subsection (2).

14 A Certificate of Qualification issued under the Regulation is effective unless cancelled or suspended by the Director in accordance with section 42 or 43 of the General Regulations.



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